Remarks

Introduction

Applicant and applicant's attorney thank the patent examiner for the courteous personal interview on October 20, 2004 at the facilities of the United States Patent and Trademark Office. The following comments track the discussion during the interview, as well as respond to the concerns that were raised by the patent examiner.

Applicant respectfully submits that the as-amended claims are patentable over the applied documents, and applicant solicits the removal of the rejections and the issuance of a Notice of Allowability and Notice of Issue Fee Due.

Applicant has presented an amendment to the Title in light of the fact that the claims to the isolated retainer stop have been deleted from the patent application so that only claims to the retainer with the dimples remain in the case.

The Rejection of Paragraph 2 – 35 USC §112, 1st Paragraph

The essence of this rejection is that the statement at page 11, lines 14-17 renders the patent application non-enabling. Application respectfully disagrees for the reasons presented below.

The text-in-question reads:

> The invention includes protruding dimples that are designed to require no radial play and, therefore, do not suffer from the same drawback as the prior art.

The "same drawback as the prior art" referred to in the above-quoted text at page 11, lines 14-17 is the drawback referred to in the earlier paragraph that concerns the difficulty in removal experienced by some prior art tools. This paragraph reads at page 10, line 34 through page 11, line 13 (emphasis added by author):

> U.S. Patent No. 4,484,783 to Emmerich, and 3,519,309 to Engle et al. disclose retainers having radially protruding surfaces (dimples, bulge) that cooperate with a notch of the bit holder bore. These protruding surfaces of the retainer are spring loaded so as to expand into the bore notch whenever the cutting tool/retainer assembly is inserted into the bore. These type prior art designs

> often became difficult to remove from bit holders after continued usage on cutting equipment. When these type prior art designs are used on mining and construction equipment, dirt and cutting debris would penetrate the clearances between the shank, retainer and bit holder bore and accumulate in the shanks annular groove. **This debris and dirt interferes with the inward radial play of the radially protruding surfaces, making the tools very difficult and sometimes impossible to remove.**

It is thus apparent that the "drawback as the prior art" has to do with the difficulty in the removal of the tool when dirt has accumulated between the retainer and the tool body. To appreciate this condition, an enlarged copy of FIG 8 of Engle et al. (Exhibit A attached hereto) and FIG. 6 of Emmerich (Exhibit A-1 attached hereto) and these drawings have been modified to show the accumulation and compaction of dirt and debris between the retainer and tool shank. When in this condition, it seems apparent that the dimple must exhibit inward radial play or else require an excessive amount of force to shear these dimples and thus remove the tool from the bore of the holder. In contrast, an enlarged view of FIG. 12 of the present application is attached hereto as Exhibit B and it has been modified to show the condition when dirt and debris are between the retainer and the tool body. When in this condition it is apparent that less radial inward play (or movement) of the dimple (46) is necessary to remove the tool using the retainer of FIG. 12 than with the tools shown in Engle et al. or Emmerich.

Applicant also points out that the statement at page 11, lines 14-17 refers to the design of the dimples wherein they "require no radial play" for the removal of the tool. The plain and simple meaning of this language is not that there may not be any radial play of the dimples upon removal of tool, but only that radial play is not a requirement for removal of the tool. Inward radial play of the dimples is not a requirement because the dimples only project between about 15 percent and about 30 percent of the thickness dimension of the retainer. This is, of course, in stark contrast to prior art dimples like those taught in Engle et al. and Emmerich that due to their more extended projection, must experience some inward radial play for removal of the tool in the absence of excessive force being exerted on the tool.

Applicant respectfully requests the removal of this rejection.

The Rejection of Paragraph 4

In Paragraph 4, the patent examiner has set forth a rejection of claims 39, 40 and 47 under 35 USC §103(a) over any one of five patents; namely, the '838 Kniff patent, the '515 Oaks et al. patent, the '147 Rettkowski patent, the '073 Sulosky et al. patent, and the '153 Sollami patent. Applicant submits that not one of these patents teaches or suggests the invention as claimed in claims 39, 40 and 47 wherein there is recited, *inter alia*, the requirement that the amount of the radial projection of the protruding surface beyond the cylindrical surface of the retainer is between about 15 percent and about 30 percent of the thickness dimension of the retainer. Applicant's discussion of each applied patent now follows.

The Kniff '838 Patent shows in FIG. 4 a retainer in which the protuberances 34 project past the surface of the retainer a distance that is greater than the thickness of the retainer body. FIG. 3 shows that the protuberances extend most of their radial extension into the corresponding groove. In order to remove the tool from the bore, the retainer of the '838 Patent must exhibit a meaningful amount of radial play for the protuberances to disengage the groove. The rejected claims call for the amount of the radial projection of the protruding surface beyond the cylindrical surface of the retainer to be between about 15 percent and about 30 percent of the thickness dimension of the retainer. Such a small extent of radial projection allows the removal of the tool without the need for inward radial play of the retainer. This is a difference that patentably distinguishes the claims over the '838 Patent to Kniff.

The Oaks et al. '515 Patent discloses a keeper ring along the lines of the retainer shown in the Kniff '838 Patent. Like for the Kniff '838 Patent, each one of the protuberances 30 projects past the surface of the retainer a distance that is greater than the thickness of the retainer body. FIG. 1 shows that in order to remove the tool from the bore, the retainer must exhibit a meaningful amount of radial play for the protuberances to disengage the groove. In order to remove the tool from the bore, the retainer of the '515 Patent must exhibit a meaningful amount of radial play for the protuberances to disengage the groove. The rejected claims call for the amount of the radial projection of the protruding surface beyond the

cylindrical surface of the retainer to be between about 15 percent and about 30 percent of the thickness dimension of the retainer. Such a small extent of radial projection allows the removal of the tool without the need for inward radial play of the retainer. This is a difference that patentably distinguishes the claims over the '515 Patent to Oaks et al.

Like for the Oaks et al. '515 Patent and the Kniff '838 Patent, the Rettkowski '147 Patent shows a retainer that has projections that project a distance beyond the surface of the retainer that is greater than the thickness of the retainer. The projections engage a groove (see, for example, FIGS. 5 and 6) in such a way that in order to remove the tool from the bore, the retainer of the '147 Patent must exhibit a meaningful amount of inward radial play for the protuberances to disengage the groove. The rejected claims call for the amount of the radial projection of the protruding surface beyond the cylindrical surface of the retainer to be between about 15 percent and about 30 percent of the thickness dimension of the retainer. Such a small extent of radial projection allows the removal of the tool without the need for inward radial play of the retainer. This is a difference that patentably distinguishes the claims over the '147 Patent.

The Sulosky et al. '073 Patent in FIG. 13 shows a retainer that has bumps; however, there is no disclosure about the dimension of the bumps in relationship to the thickness of the retainer. Thus, the patent examiner cannot properly use the '073 Patent as a basis for this rejection.

Like for some of the above patents, the Sollami '153 Patent shows nodules that project past the surface of the retainer a distance that is at least as great as the thickness of the retainer body. In order to remove the tool from the bore, the retainer of the '153 Patent must exhibit inward radial play for the protuberances to disengage the groove. The rejected claims call for the amount of the radial projection of the protruding surface beyond the cylindrical surface of the retainer to be between about 15 percent and about 30 percent of the thickness dimension of the retainer. Such a small extent of radial projection allows the removal of the tool without the need for inward radial play of the retainer. This is a difference that patentably distinguishes the claims over the '153 Patent to Sollami.

In summary, while the patent examiner may take the position that the dimension of the protruding surface makes no difference, the fact of the matter is that it does make a

difference as explained hereinabove. Applicant hereby respectfully requests the removal of these rejections.

The Rejection of Paragraph 5

In Paragraph 5, the patent examiner has rejected claims 15-17, 29-30, 32-40 and 43-47 as unpatentable over any one of eight applied patents. These claims recite, *inter alia*, the requirement that the amount of the radial projection of the protruding surface beyond the cylindrical surface of the retainer is between about 15 percent and about 30 percent of the thickness dimension of the retainer. Applicant submits that none of these patents teaches or suggests the claimed invention since each one of these patents presents projections that project a distance from the surface of the retainer distance relative to the thickness of the retainer that is multiple times the claimed distance. Applicant submits that it is more than merely an obvious matter of design in light of the advantages of the smaller protrusions that have been discussed in connection with the rejection under Paragraph 10 of the Office Action. Each one of the eight applied patents will now be addressed below.

The Engle et al. '309 Patent discloses in FIG. 10 a retainer that clearly has protuberances that extend a distance past the surface that is greater than the thickness of the retainer. As shown by the cross-sectional views of FIGS. 9 and 12, in order to remove the tool from the bore, the retainer of the '309 Patent must exhibit a meaningful amount of radial play for the protuberances to disengage the groove. As pointed above hereinabove, the rejected claims call for the amount of the radial projection of the protruding surface beyond the cylindrical surface of the retainer to be between about 15 percent and about 30 percent of the thickness dimension of the retainer. Such a small extent of radial projection allows the removal of the tool without the need for inward radial play of the retainer. This is a difference that patentably distinguishes the claims over the '309 Patent to Engle et al.

The thickness of the retainer in the Radd et al. '158 Patent is undeterminable for certain. Thus, the patent examiner cannot properly use the Radd et al. patent as a basis for this rejection.

The Kniff et al. '708 Patent shows in FIG. 5 a retainer has protuberances that extend a distance past the surface that is greater than the thickness of the retainer. FIG. 4 shows that in

order to remove the tool from the bore, the retainer of the '708 Patent must exhibit a meaningful amount of radial play for the protuberances to disengage the groove. The rejected claims call for the amount of the radial projection of the protruding surface beyond the cylindrical surface of the retainer to be between about 15 percent and about 30 percent of the thickness dimension of the retainer. Such a small extent of radial projection allows the removal of the tool without the need for inward radial play of the retainer. This is a difference that patentably distinguishes the claims over the '708 Patent.

The Emmerich '783 Patent shows a band that projects a radial distance past the surface that is greater than the thickness of the retainer. The cross-sectional views of FIGS. 5 and 6 shows that in order to remove the tool from the bore, the retainer of the '783 Patent must exhibit a meaningful amount of radial play for the protuberances to disengage the groove. The rejected claims call for the amount of the radial projection of the protruding surface beyond the cylindrical surface of the retainer to be between about 15 percent and about 30 percent of the thickness dimension of the retainer. Such a small extent of radial projection allows the removal of the tool without the need for inward radial play of the retainer. This is a difference that patentably distinguishes the claims over the '783 Patent.

It is not possible to ascertain the thickness of the retainer in the Dziak '986 Patent. Thus, the patent examiner cannot properly use the '986 Patent in a rejection of these claims.

The Beach et al. '649 Patent shows radially inwardly projecting projections, and thus, applicant submits that the '649 Patent cannot address the claims now under rejection.

The Beach '323 Patent shows a retainer 16 that is the same as the retainer of the '309 Engle et al. patent and the '515 Oaks et al. patent (see Column 5, lines 31-36). This retainer has protuberances that extend a distance past the surface that is greater than the thickness of the retainer. In order to remove the tool from the bore, the retainer of the '323 Patent must exhibit a meaningful amount of radial play for the protuberances to disengage the groove. The rejected claims call for the amount of the radial projection of the protruding surface beyond the cylindrical surface of the retainer to be between about 15 percent and about 30 percent of the thickness dimension of the retainer. Such a small extent of radial projection allows the removal of the tool without the need for inward radial play of the retainer. This is a difference that patentably distinguishes the claims over the '323 Patent to Beach.

The Montgomery, Jr. '502 Patent shows a retainer that has protuberances that extend a distance past the surface that is at least as great as the thickness of the retainer. In order to remove the tool from the bore, the retainer of the '502 Patent must exhibit a meaningful amount of radial play for the protuberances to disengage the groove. The rejected claims call for the amount of the radial projection of the protruding surface beyond the cylindrical surface of the retainer to be between about 15 percent and about 30 percent of the thickness dimension of the retainer. Such a small extent of radial projection allows the removal of the tool without the need for inward radial play of the retainer. This is a difference that patentably distinguishes the claims over the '502 Patent.

While the patent examiner argues that the dimension of the dimples or the protruding surface makes no difference, the fact of the matter is that it does for the reasons expressed above. Applicant thus requests the removal of the rejections of these claims.

Comments as to the Amount of Radial Projection of the Dimple

The claims call for the amount of radial projection of the dimple beyond the cylindrical surface of the retainer is between about 15 and about 30 percent of the thickness dimension of the retainer. The upper limit and lower limit of this range has significance and meaning as explained hereinafter.

As pointed out during the interview of October 20, 2004, the inventor recognized that in drilling applications, the operators were frequently experiencing great difficulty in removing the tools from the holders. In order to better understand the issue, the inventor made a test apparatus as illustrated in the photograph marked as Exhibit C. Using this apparatus, the inventor conducted a simple test on a Kennametal U40 style of tool that was in the bore of a holder. During the test, the test apparatus failed at a force of 13,000 pounds. The tool was then extracted by impacting the rear of the tool with a sledgehammer. The photograph (Exhibit D attached hereto) that shows the U40 tool wherein the dimples on the retainer have been sheared and flattened. This photograph also shows some of the dirt that had accumulated between the retainer and the tool during operation.

The inventor appreciated that the necessity to use a sledgehammer to extract a tool was an undesirable situation. Thus, the inventor applied the concept of using shorter dimples

that would not offer as much resistance to extract the tools if the dimples were unable to move in a radial inward direction during the extraction operation.

The failure load of about 13,000 pounds referred to above is consistent with a calculation that over about 14,000 pounds (i.e., about 14,894 pounds) of force would be necessary to remove a Kennametal U40 style of tool if such removal required all four dimples of the retainer to be sheared at their bases. This calculation is set forth in the top row of the Table I attached hereto as Exhibit E.

Referring to the columns of Table I, the column identified as "Retainer" refers to the style of retainer wherein U40 refers to the retainer used with the U40 tool and "K-1786" refers to a specific embodiment of the inventive retainer. The reference to DWG 9810299 is to the retainer used in conjunction with the U40 tool and is shown in the drawing marked Exhibit F. The reference to DWG 8410247 is to a specific embodiment of the inventive retainer, and is shown in the drawing marked Exhibit G.

The column identified as "Material Thickness" refers to the thickness (in inches) of the material used to make the retainer. The column identified as "Dimple Height" refers to the distance (in inches) the dimple protrudes from the exterior surface of the retainer. The column identified "Diameter base sheared" refers to the diameter (in inches) of the dimple at its base (i.e., joinder with the body of the retainer). The sixth column from the left sets forth the outside area (in square inches) of the dimple, the inside hollow area (in square inches) of the dimple, and the shear area (in square inches) of the dimple. Taking into consideration that the retainers were made from 1050 spring steel that has a shear strength equal to 120,000 psi, the strength of each dimple was calculated in pounds and set forth in the seventh column from the left. The total force necessary to shear the retainer so that the tool can be removed from the holder is four times of the shear strength of each dimple, and this value is set forth in the eighth column from the left.

Referring to the claimed limits of the numerical range for the extent that the dimples project past the exterior surface of the retainer, the numerical range of about 15 percent corresponds to the practical minimum extent that the dimple can project past the surface of the retainer and still maintain the tool within the bore during operation. In this regard, the calculation of the holding force of a retainer of a thickness equal to about .045 inches with a

dimple that has a projection equal to about .007 inches shows a holding force equal to a little over about 2000 pounds (i.e., 2007 pounds). Please see the third row identified as "15%" in Table I that sets forth the details of this calculation. This level of holding force is approximately the minimum force needed to retain the tool in the bore.

The numerical range of about 30 percent corresponds to the practical maximum that the dimple can project past the surface of the retainer and not create the problem that the invention is intended to solve, i.e., the necessity of an excessive amount of force needed to extract the tool from the bore when dirt and debris has become lodged between the retainer and the tool so as to interfere with the radial inward play of the dimples (see page 11, lines 10-17). In this regard, the calculation of the holding force of a retainer of a thickness equal to about .066 inches with a dimple that has a projection equal to about .020 inches shows a holding force equal to a little more than about 3300 pounds (i.e., 3318 pounds). Please see the fourth row identified as "30%" in Table I that sets forth the details of this calculation. This level of holding force is approximately the maximum force that an operator can reasonably conveniently remove without resorting to extraordinary means such as the use of a sledgehammer.

In regard to the specific dimensions presented in the specification, at page 11, lines 20-23 discloses that the dimples may project past the exterior cylindrical surface of the retainer a distance equal to between about .007 inches and .020 inches. At page 17, lines 13-20, the specification describes the retainer sleeve as having a thickness equal to between .033 inches and .066 inches with one embodiment having a thickness equal to .045 inches. Based upon these disclosures in the specification, the minimum range of 15 percent generally correlates to .007 inches (i.e., the minimum dimple height) divided by .045 inches (i.e., one typical retainer thickness), i.e., 15.5 percent. The maximum range of 30 percent generally correlates to .020 inches (i.e., the maximum dimple height) divided by .066 inches (i.e., the maximum retainer thickness), i.e., 30.3 percent.

Applicants submits that the numerical range for the extent the dimple projects past the exterior surface of the retainer is not arbitrary, but correlates to the specification as indicated above and achieves the dual goals of: (1) providing sufficient holding force to maintain the

tool in the bore during operation, and (2) not requiring an excessive amount of force to remove the tool from the bore of the holder.

Conclusion

Applicant respectfully submits that the pending claims define over the applied documents. Applicant solicits the issuance of a Notice of Allowability and a Notice of Allowance and Issue Fees Due.

Applicant requests if the patent examiner does not agree with the applicant's arguments, but has suggestions to place the claims in form for allowance, that the patent examiner telephone the undersigned attorney (615 662 0100) or Mr. Matthew W. Smith (724-539-3848) to discuss the case.

Respectfully submitted,

Stephen T. Belsheim
Reg. No. 28,688

Belsheim Law Office
179 Belle Forrest Circle
Suite 102
Nashville, Tennessee 37221
Telephone 615 662 0100
Facsimile 615 662 0352
Customer No. 1400

U.S. Patent No. 3,519,309 to Engle et al.

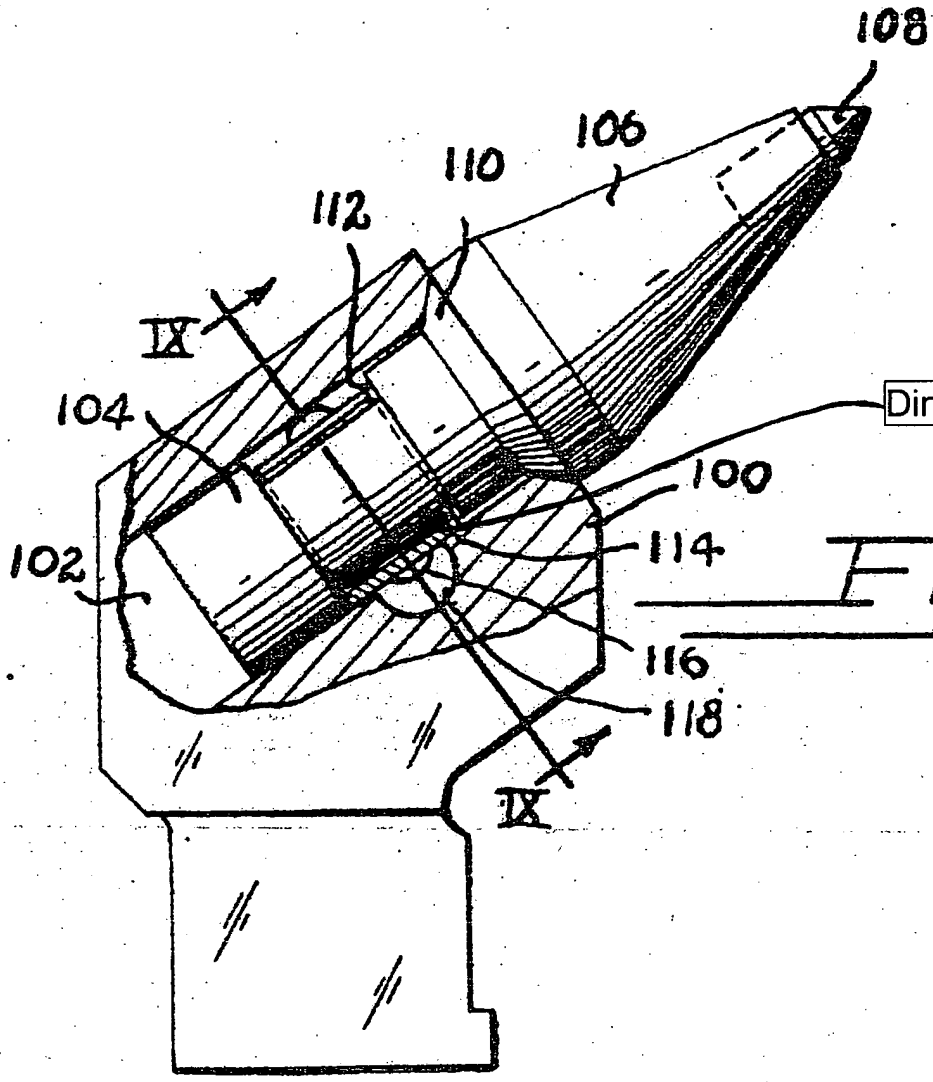


Fig. 8

EXHIBIT
A

U.S. Patent No. 4,484,783 to Emmerich

FIG. 5

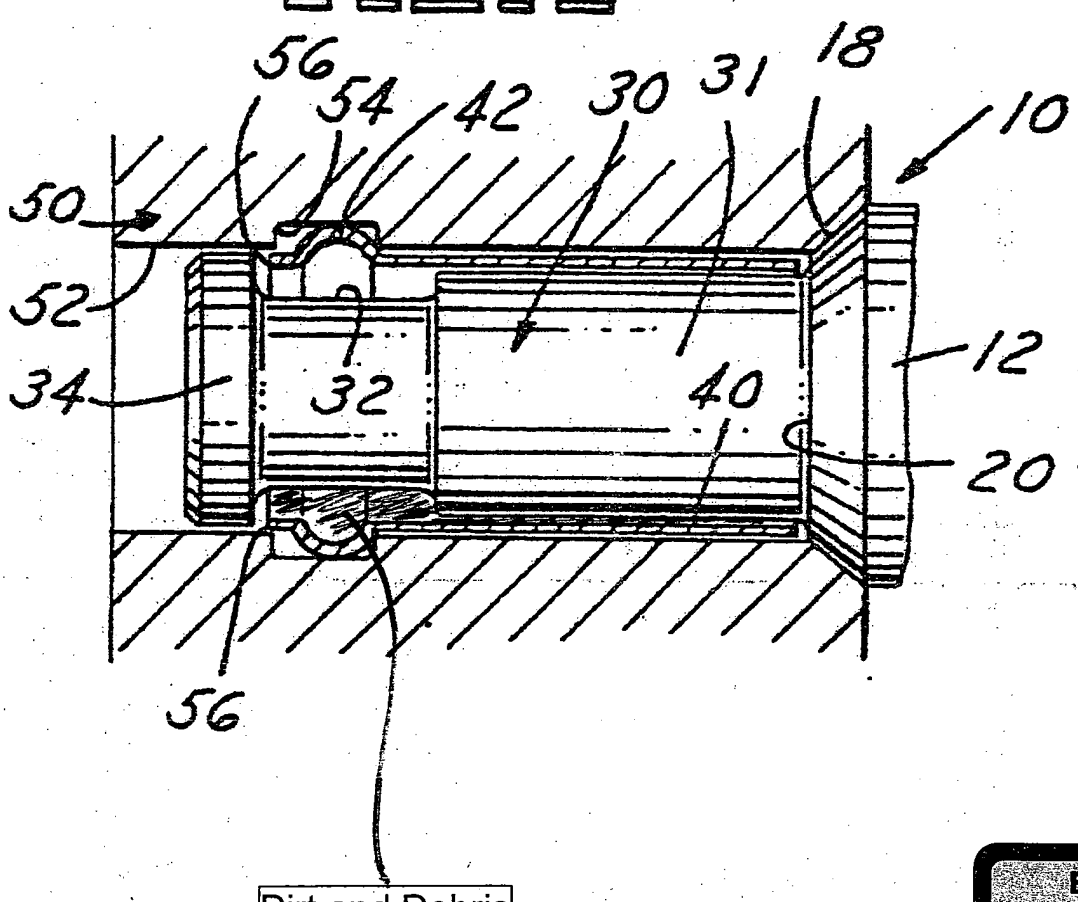


EXHIBIT
A-1

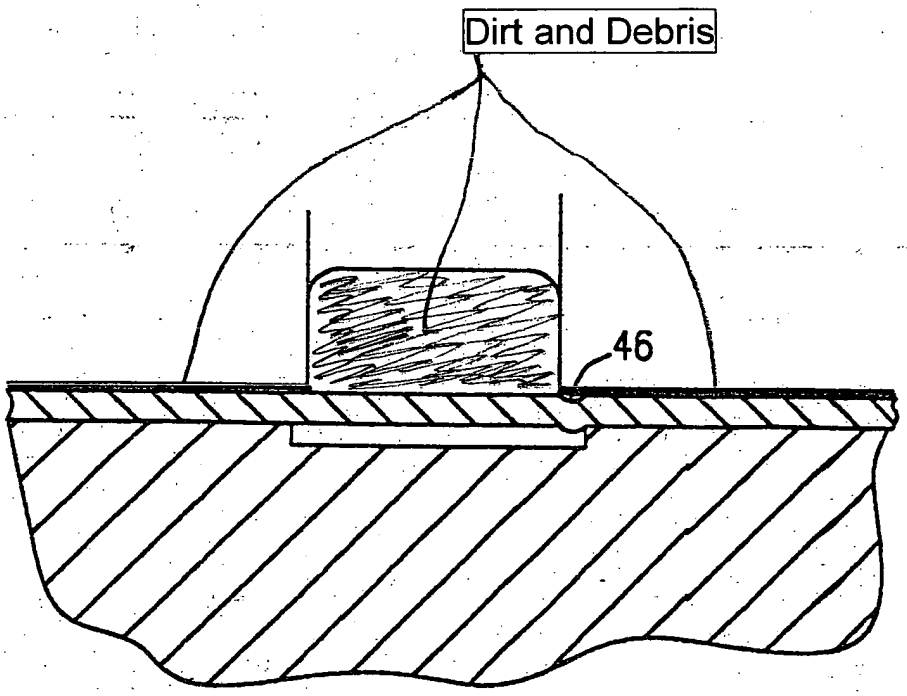
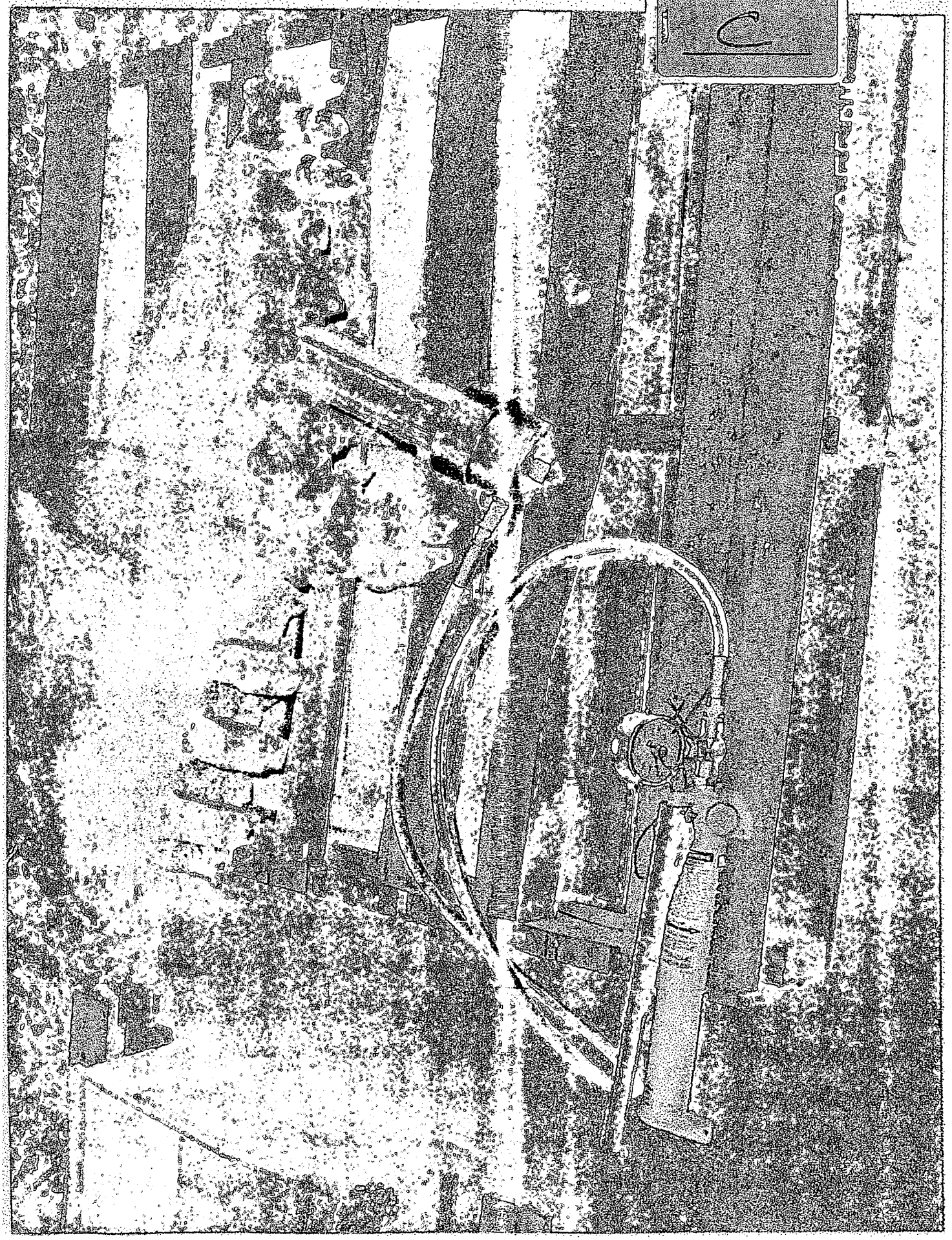


FIG. 12

EXHIBIT

C



EXHIBIT

D

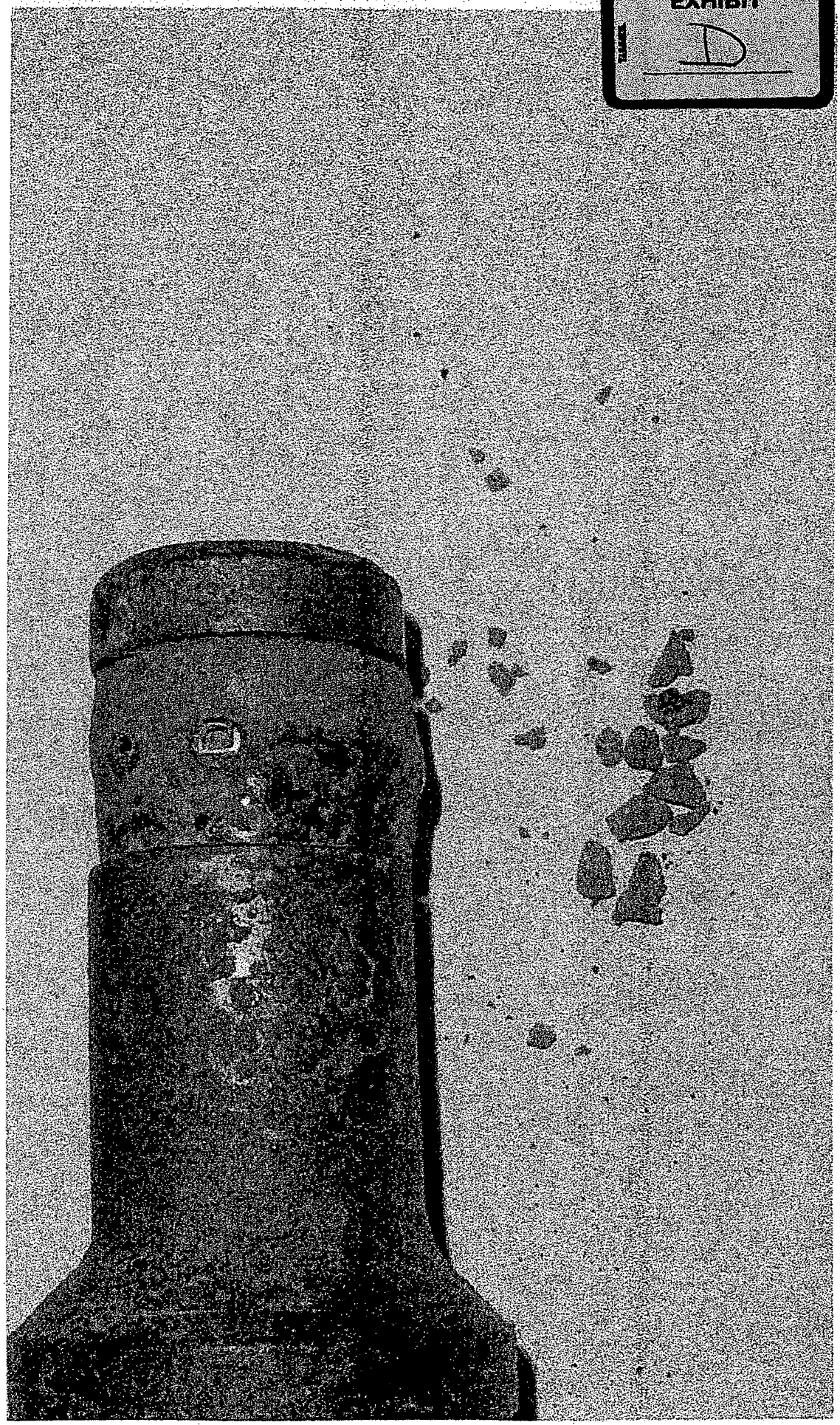
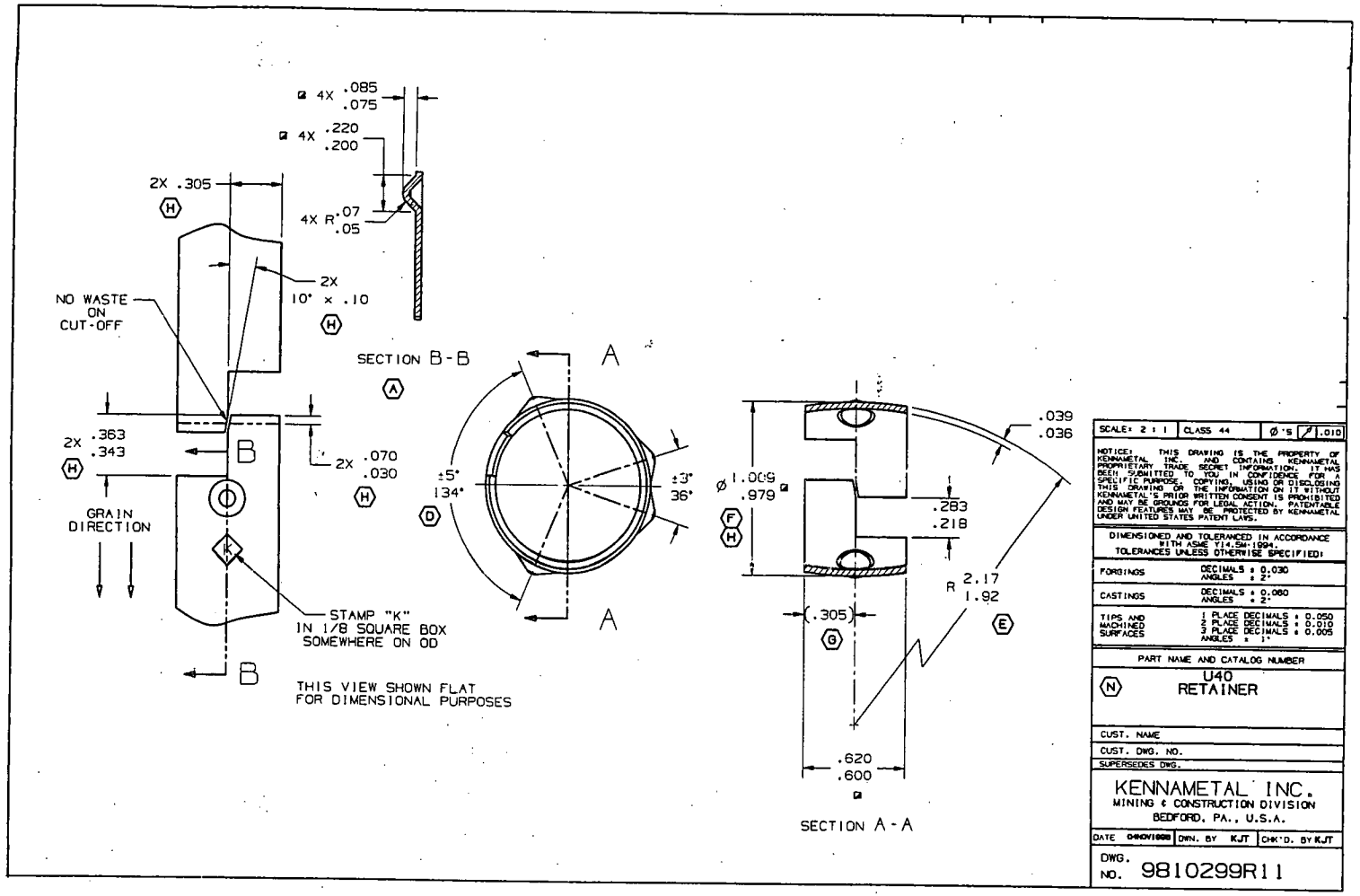


Table I – Calculations of Shear Strength

Retainer	Reference	Material Thickness	Dimple Height	Diameter base sheared			Shear Strength	x 4 dimples
U40	dwg.9810299	0.0375	0.08	0.21	outside area	0.037639		
				0.088	inside hollow area	0.00661		
	Exhibit D				Shear area	0.03103	3724	14894
K-1786	dwg.8410247	0.0400	0.015	0.08	outside area	0.005462		
					inside hollow area	0		
					Shear area	0.005462	655	2622
		0.0450	0.007	0.07	outside area	0.004182		
	15%				inside hollow area	0		
					Shear area	0.004182	502	2007
		0.0660	0.020	0.09	outside area	0.006913		
	30%				inside hollow area	0		
					Shear area	0.006913	830	3318


4X .085 .075
4X .220 .200
2X .305
(H)
4X R.07 .05
2X 10° x .10
(H)
NO WASTE ON CUT-OFF
SECTION B-B
(A)
2X .363 .343
(H)
B
2X .070 .030
(H)
GRAIN DIRECTION
STAMP "K" IN 1/8 SQUARE BOX SOMEWHERE ON OD
B
THIS VIEW SHOWN FLAT FOR DIMENSIONAL PURPOSES
A
±5° 134°
(D)
±3° 36°
A
.039 .036
ø1.009 .979
(F) (H)
.283 .218
R 2.17 1.92
(E)
(.305)
(G)
.620 .600
SECTION A-A
SCALE: 2 : 1
CLASS 44
Ø .5 .010
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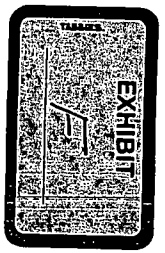
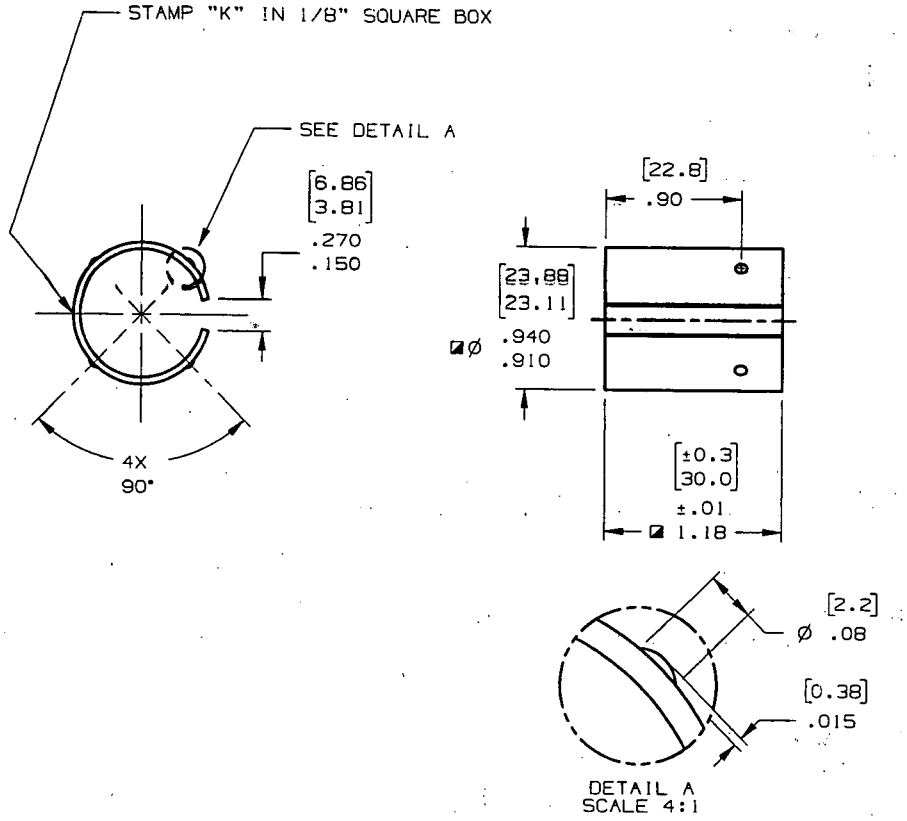
DIMENSIONED AND TOLERANCED IN ACCORDANCE WITH ASME Y14.5M-1994. TOLERANCES UNLESS OTHERWISE SPECIFIED:
FORGINGS DECIMALS ± 0.030 ANGLES ± 2°
CASTINGS DECIMALS ± 0.060 ANGLES ± 2°
TIPS AND MACHINED SURFACES 1 PLACE DECIMALS ± 0.050 2 PLACE DECIMALS ± 0.010 3 PLACE DECIMALS ± 0.005 ANGLES ± 1°
PART NAME AND CATALOG NUMBER
(N) U40 RETAINER
CUST. NAME
CUST. DWG. NO.
SUPERSEDES DWG.
KENNAMETAL INC.
MINING & CONSTRUCTION DIVISION
BEDFORD, PA., U.S.A.
DATE 04NOV1998
DWN. BY KJT
CHK'D. BY KJT
DWG. NO. 9810299R11



EXHIBIT

NO.	DATE	REVISION (ON CAD ONLY)	CHGD BY	APP BY	REVISION NO.



SCALE: 1 : 1	CLASS 44	Ø'S ⌀ .010

DIMENSIONED AND TOLERANCED IN ACCORDANCE WITH ASME Y14.5M-1994.
TOLERANCES UNLESS OTHERWISE SPECIFIED:

FORGINGS	DECIMALS ± 0.030 ANGLES ± 2°
CASTINGS	DECIMALS ± 0.060 ANGLES ± 2°
TIPS AND MACHINED SURFACES	1 PLACE DECIMALS ± 0.050 2 PLACE DECIMALS ± 0.010 3 PLACE DECIMALS ± 0.005 ANGLES ± 1°

PART NAME AND CATALOG NUMBER

LR87D
RETAINER

CUST. NAME

CUST. DWG. NO.

SUPERSEDES DWG.

KENNAMETAL INC.
MINING & CONSTRUCTION DIVISION
BEDFORD, PA., U.S.A.

DATE 2004-08-18	DWN. BY MKL	CHK'D. BY CDR

DWG